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HALLER'S COMPARATIVE ANATOMY.

Lehrbuch der vergleichenden Anatomie. By B. Haller. Pp. viii+914. Erste Lief., pp. vi+424, price 8 marks; Zweite Lief., pp. viii+425 to 914, price 12 marks; illustrated. (Jena: Gustav Fischer, 1904.)

IN his preface the author explains that his aim in writing this book was to produce a modern work on the lines of the second or last edition of Gegenbaur's "*Grundriss der vergleichenden Anatomie*," which was published twenty-four years ago. The book deals in a concise manner with the structure of all animals from the Protozoa to the highest Vertebrata. The character and mode of treatment of the subject will be sufficiently described by the statement that the author closely follows in Gegenbaur's footsteps. For his material he has drawn very largely from Gegenbaur's recent "*Vergleichende Anatomie der Wirbelthiere*" (1898 and 1901); but as he devotes much more space—almost half the book—to the Invertebrata than is given to this branch of the subject in the latter work, he has freely used the facts and illustrations found in the great treatises of A. Lang and Korschelt and Heider in compiling the first part.

The whole book, with the exception of the part dealing with the structure of the brain of vertebrates, concerning which the author has published some original memoirs ("*Morphologisches Jahrbuch*," 1898 and 1900), is obviously a compilation, and not from the original writings, but from such books (themselves of necessity largely compilations) as have already been mentioned. The result is what one would naturally expect. The book reproduces many of the mistakes of the works from which it is derived, and adds not a few misinterpretations which do not occur in these; the information is not up to date. The author is, for example, unaware of J. P. Hill's discovery of a placenta in the Marsupialia, and is apparently ignorant of Willey's work on *Balanoglossus*; the descriptions are disjointed and difficult to understand, such as would be written by one who has no adequate practical acquaintance with the facts, or has not digested the mass of pabulum with which he is dealing. Anyone who has had occasion to make use of the last edition of Gegenbaur's "*Vergleichende Anatomie*" knows to how great a degree this work fails to reach the high level of the first edition, which was written when the author was in his prime. In the last edition Gegenbaur relied in too many cases upon the immature work of young contributors to the "*Morphologisches Jahrbuch*" in preference to more trustworthy researches published elsewhere. All such faults are reproduced in Haller's book.

The attempt to cover so vast a field as the entire animal kingdom is such a colossal undertaking in the present state of knowledge that one hesitates before hastily passing judgment on the work as a whole. In such circumstances the reviewer naturally turns for an estimate to those parts of the book in which the author might claim to write as an expert. The portion deal-

ing with the brain of the Vertebrata is almost entirely original.

The difficulty of understanding the author's meaning which characterises the greater part of the book is greatly increased in the case of the nervous system by his frequent abuse of terms and the needless invention of new names for structures which already have designations familiar to all anatomists. But, in addition, his account of the brain is so studded with inaccuracies that the mere enumeration of them would fill the whole space devoted to this review. It is sufficient to quote only a few from among many others equally astounding. While he correctly locates the caudal limit of the forebrain on the dorsal side at the posterior commissure, he places it on the ventral side at the junction between the mid- and hind-brain, which he calls "*sulcus interencephalicus*" (p. 623 and elsewhere). In reptiles, birds, and mammals he calls the paraterminal body (which in mammals becomes converted into the septum lucidum and the precommissural area) by the name "*gyrus fornicatus*"—a term which is employed by all other anatomists to designate a strip of neopallium above the corpus callosum (pp. 633 and 638 *inter alia*). To add to the confusion, he labels the fascia dentata in a marsupial brain "*gyrus fornicatus*" (p. 640). In figures of the brains of reptiles, birds, and a mammal (rabbit), he labels as "*sulcus coronarius*" furrows which are certainly not homologous the one with the other; and even in the mammal it is not the "coronary" but the "lateral" sulcus on which he has placed the label. On p. 638 he refers to the hippocampus as "part of the occipital lobe," and on the preceding page he states that the occipital lobe is separated from the frontal lobe in *Echidna* by the Sylvian fissure; by the latter term he refers to a furrow (p. Fig. 629), which resembles the Sylvian fissure neither in form nor in position. But the most erroneous and hopelessly muddled parts of his account of the brain are his numerous references to the cerebral commissures. He seems to imagine that the "*fimbria*" and "*fornix*" (names applied by anatomists to different parts of the same series of hippocampal fibres) are independent structures, and he refers to the fornix-commissure by the term "*fimbria-commissure*," and applies the former term in one place to a part of the anterior commissure, which has no connection whatever with the fornix, and in another place to the corpus callosum! To this amazing confusion he adds the further error of attributing to *Phascolomys* a corpus callosum like that of *Erinaceus*, and representing an utterly different state of affairs in *Didelphys*, whereas all marsupials lack a true corpus callosum.

His spelling of many terms is somewhat peculiar. As examples I might quote "*thalamocephalon*" (p. 636), "*rhinocephalon*" (p. 638), "*thela*" (p. 637), and "*corpus callosi*" (in several places).

If we judge the whole work by the part to which the author has devoted his chief attention no condemnation of it can be considered too harsh. It is confused, inaccurate, and difficult to understand.

The book has one great redeeming feature in its numerous illustrations. They are, on the whole, well

chosen, clearly and yet artistically drawn, and excellently reproduced. The sources from which they were derived are indicated in some cases only, although a number of the unacknowledged figures will be familiar to the readers of zoological literature.

There is an unduly large number of misprints in the book, especially in the lettering and the inscriptions of the various figures. There is no bibliography.

G. E. S.

LIQUID CRYSTALS.

Flüssige Kristalle: sowie Plastizität von Kristallen im Allgemeinen, Molekulare Umlagerungen und Aggregatzustandsänderungen. By Dr. O. Lehmann. Pp. vi+264; atlas of 39 photographic plates. (Leipzig: W. Engelmann, 1904.) Price 11. net.

WHATEVER may be the ultimate conclusion of physicists concerning the explanation of the interesting phenomena described by the author of this volume under the term "liquid crystals," and however diverse may be the views entertained as to their bearing on current molecular theories, there can be no difference of opinion as to the value of the work before us, in which the description of these phenomena is so clearly set forth and so fully illustrated.

It was in 1889 that Dr. Otto Lehmann, the professor of physics in the Technical High School of Karlsruhe, and the author of many memoirs dealing with the application of microscopical methods to physical research, first suggested the use of this term "liquid crystals." The acceptance of the term by physicists and crystallographers has not been by any means universal or unqualified, and in certain quarters it has been received with something like ridicule. The general attitude which, with our present knowledge of the subject, it may be wise to preserve was well expressed by Prof. Miers in an article upon the subject which he contributed to *Science Progress* of January, 1897:—

"It will be wise to retain the names crystal and crystalline in their old significations, rather than to extend them so as to include the birefringent liquids whose existence has been established by Lehmann. It may be that these remarkable drops are examples of liquid matter in which particles while free to move are compelled to preserve the same orientation, and differ in this respect from ordinary liquids. But whether this peculiarity of structure, whatever may be its nature, is really analogous to that of solid crystals is a question in which it will be better not to commit ourselves to an answer by applying the same name to both until more is known about the structure both of liquids and solids."

It is not probable that the present volume will materially affect the cautious verdict pronounced by Prof. Miers, seven years ago, on behalf of crystallographers and physicists, for although many new and interesting observations are added to those announced in Prof. O. Lehmann's earlier memoirs, there is nothing in the work before us which can be regarded as supplying absolutely conclusive or crucial evidence on the subject.

In his original memoir Dr. O. Lehmann was able to confirm the observations of Reinitzer and of Gatter-

mann that certain organic compounds possess two melting points, and he showed that, at temperatures between these two melting points, the substances, though possessing the freedom of motion of liquids, affect polarised light like crystals, and, like crystals, exhibit the phenomenon of dichroism.

In the treatise under review the list of organic compounds exhibiting these remarkable properties is considerably augmented, though all the newly described substances are closely allied in their chemical nature to those previously known. Dr. O. Lehmann proposes to divide them into two classes—"Fließende Krystalle," in which between the two melting points the crystal retains something of its original form, modified by the rounding of the edges and angles, though two of them brought into contact have sufficient mobility to enable them to unite; and true "Flüssige Krystalle," in which, although the original crystal form is wholly lost and the substance forms rounded and very mobile drops, the double refracting and other optical properties of the crystal are nevertheless retained. It is, however, admitted by Lehmann that the distinction between these two classes of substances is neither very definite nor of fundamental character.

It is impossible in the space at our command, even if such a course were desirable, to enter upon the discussion of the physical relations of solids and liquids which the author bases on his observations. On many points he arrives at conclusions in marked opposition to those maintained by Butschli, Nernst, Ostwald, and other physicists.

By the aid of the beautiful photographs, so admirably reproduced in the plates, and the numerous diagrammatic figures in the text, the reader will find it possible to follow and understand the very interesting observations of the author. The value of the photographs would certainly have been increased if, in every case, the degree of magnification had been indicated; and a detailed description of the plates with a good index would have added to the value of this very important treatise.

THE TESTING OF STEELS.

Relations between the Effects of Stresses Slowly Applied and of Stresses Suddenly Applied in the Case of Iron and Steel. Comparative Tests with Notched and Plain Bars. By Pierre Breuil. Pp. vii+152+23 plates. *Jour. Iron and Steel Inst. Supplement*, vol. lxxv. (London: Iron and Steel Institute, 1904.)

CONSIDERATION of the subject of tests and testing should be approached with a very open mind, not only because it is the common meeting ground of the engineer and the metallurgist, but because it is a difficult subject of compromise, where the selected method is practically never ideal. Steel is necessarily as often submitted to tests which it is hoped will give a measure of its qualities as to those stresses to which it will be exposed in practice. The latter is the practical ideal test short of behaviour in actual use which is seldom feasible, as often the finish of the test would require to be left to another generation. Thus the real purpose of tyres or rails is to wear well without breaking; nevertheless, they are often tested